Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Revision of Part 15 of the Commission's Rules	)	ET Docket No. 98-153
Regarding Ultra-Wideband Transmission	)	
Systems	)	

To: The Commission

REPLY COMMENTS
OF ALLOY LLC

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SUMMARY

Alloy, LLC agrees that ultra-wideband ("UWB") technology can potentially provide new and expanded wireless offerings, including applications not achievable using traditional wireless techniques. However, UWB is relatively untested; and it poses significant dangers of interference and disruption to wireless services and applications on which the public relies for safety, commerce, and convenience. The FCC has acknowledged that further testing of this new technology is needed to understand the risks of interference. It is important, therefore, for the FCC to proceed with caution and permit specific UWB applications only after adequate testing has been conducted and regulations adopted to assure non-interference once UWB usage proliferates.

Further Testing Needed Before Permitting UWB Use. The Commission must not authorize the use of UWB until its interference potential is fully understood. After sufficient testing, a record can be compiled concerning whether and how to relax the ban on UWB transmissions without causing interference to services using spectrum that UWB transmissions would overlay. Once the test results are in, a supplemental round of comments may not be sufficient for creating a record on what the rules should be, given the open-ended nature of the NPRM; there should be a further notice of proposed rulemaking with specific rule proposals keyed to the test results, which would facilitate meaningful comment.

Licensed, Not Unlicensed, Operation. Alloy opposes unlicensed operation at this point; it is unnecessary and would be very unwise. Licensing is eminently practical in the near term, given that the first wave of UWB applications will be ground- and wall-penetrating radars to be used mostly by professionals, not mass-marketed consumer applications. Licensing is also essential, at least until this new technology has been proven to be non-interfering in practice. Unlicensed operation could be disastrous if there are interference problems, because there would be no central repository of information concerning who has the devices and is using them, and no ready method for tracking usage or compiling interference data.

Coordination Is Needed. Whether UWB is licensed or unlicensed, coordination of UWB devices should be required until sufficient data have been collected to understand the UWB interference potential. The very nature of UWB devices requires a coordination process before deployment — conventional licensees and other users of UWB technology need to be able to determine who is using UWB devices, and where, to avoid causing interference and to tracking any interference that occurs. The Commission has previously required coordination of unlicensed Part 15 devices: Unlicensed PCS devices can only be used if they can automatically be coordinated. After initial deployment, if the results show that interference is not a serious concern in practice, it may be appropriate to eliminate the coordination requirement for devices within a defined technical threshold. At this point, however, there is no record for making such a judgment.

Interference to Assisted GPS used for Phase II E-911 Compliance. It is widely recognized that there is a potential for interference between UWB devices and Global Positioning System ("GPS") satellite signals, but the interference potential is even greater where "Assisted GPS" technology is concerned. This technology is under consideration by CMRS carriers for accurately locating wireless devices used to call 911, as required by the Commission's Phase II E-911 rules. Assisted GPS receivers effectively reach a sensitivity level some 50 dB below the noise

floor of an RF receiver with a bandwidth corresponding to the 10 MHz GPS signal bandwidth. This enhanced sensitivity makes assisted GPS especially vulnerable to interference from UWB devices, which transmit at a power spectral density below the noise floor but *above* the sensitivity level of an Assisted GPS receiver. The Commission should understand the effect of UWB on Assisted GPS before allowing deployment of UWB devices.

Interference from UWB Communications Devices. The NPRM identified both location applications and wireless communications applications for UWB. While many of the location applications are not readily feasible using non-UWB technology, the communications applications of UWB technology (*e.g.*, wireless networking, secure covert communications) are not uniquely or inherently dependent on use of UWB technology. Alloy is strongly opposed to authorizing the use of UWB technology for communications purposes at this time, given the potential interference that could result to existing forms of communications and the availability of other technologies to accomplish the same ends.

Interference Concerns Relating to UWB Location Devices. UWB advocates are proposing widely varying standards, based principally on experimentation with location applications of UWB, such as GPRs and wall-penetrating location devices. These applications, if not properly constrained by the Commission's rules, can be the source of destructive, and possibly undetectable, interference to GPS and CMRS, which are relied upon by businesses, consumers and public safety entities. Alloy notes, in this connection, that Time Domain's architecture cannot readily isolate GPS frequencies from interference, while that of MultiSpectral Solutions can. Accordingly, if testing reveals that UWB poses a credible threat of interference in the GPS bands or civilian communications bands (such as the current CMRS bands, the 2 GHz emerging technologies bands, or the 2.7 GHz MMDS/ITFS bands that are candidates for IMT-2000 "3G" technology), the Commission should focus its attention on UWB solutions that can avoid the potential for interference in such bands.

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Alloy, LLC ("Alloy")[1] hereby replies to the comments filed in response to the Commission's *Notice of Proposed Rulemaking,* FCC 00-163 (May 11, 2000) (*NPRM*). The Commission proposed, in the *NPRM,* to amend its rules to permit the use of ultra-wideband ("UWB") transmissions and to establish the technical and other limitations applicable to such operations. Alloy agrees that UWB has considerable potential to provide a variety of new and expanded uses of wireless technology. In particular, UWB may make possible wireless applications that could not be achieved using traditional wireless techniques. Nevertheless, this technology is relatively untested and poses significant dangers of interference and disruption to wireless services and applications on which the public relies for safety, commerce, and convenience. Accordingly, the Commission must proceed with due caution and permit specific UWB applications only after adequate testing has been conducted and regulations adopted to provide assurance that interference will not result once UWB usage proliferates.

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[1] Alloy, LLC is a new nationwide provider of wireless services that brings together in a single company the cellular, PCS, and messaging services formerly provided separately by affiliates of BellSouth Corporation and SBC Communications Inc.

INTRODUCTION

UWB is an intriguing technology that is full of promise. The transmission of very brief pulses of electromagnetic energy results in RF emissions over an extremely broad frequency range, making possible applications that cannot be readily accomplished using transmissions within a conventionally limited frequency range. Frequency-dependent effects such as multipath and Rayleigh fading may be avoided by using UWB transmissions. In short, UWB technology represents a potential shift of the wireless paradigm from the frequency domain to the time domain.

There is a reason why RF engineers have concentrated on development in the frequency domain for the better part of a century, however. In the early days of radio, spark-gap radios were used; these radios used "damped wave" emissions — essentially, they transmitted a series of electromagnetic pulses resulting in broadband signals. These transmissions resulted in destructive interference. As a result, damped wave emissions were outlawed; to prevent interference, regulators limited transmissions to specific frequency bands and channels.

Recently, researchers have focused on ways to utilize pulsed emissions that take advantage of the tremendous advances in technology that have occurred. Now, pulsed emissions can be precisely timed and shaped, unlike the emissions from the spark-gap transmitters of the 1920s. Modern technology may be able to eliminate or mitigate the adverse effects that were traditionally associated with these techniques. Accordingly, the Commission has correctly concluded that the longstanding ban on UWB transmissions and damped wave emissions should be reexamined.

UWB may make possible new applications of wireless technology that cannot be achieved by traditional wireless techniques. For example, the use of UWB radar for ground and building penetration may yield important advances for law enforcement, construction safety, and search and rescue. Other innovative applications may be developed, as well.

At the same time, Alloy is concerned with the interference potential of UWB systems. The transmission of UWB energy has the *potential* to interfere with a wide range of wireless applications and services, because such transmissions occur over a wide range of frequencies already being used by existing radio services. The UWB technology being considered here is new, and the Commission has acknowledged that "[f]urther testing and analysis is needed before the risks of interference are completely understood."[2] Accordingly, Alloy urges the Commission to proceed slowly, purposefully, and cautiously before any authorization of UWB deployment.

DISCUSSION

I. UWB TECHNOLOGY MUST BE AUTHORIZED PURSUANT TO INTERFERENCE GUIDELINES DEVELOPED BASED ON EXHAUSTIVE TESTING

UWB technology is a new and possibly useful technology, especially for remote sensing and safety applications. However, UWB transmissions may overlay radio spectrum that is already fully occupied and robustly utilized. The spectrum supports a variety of useful, vital, and critical communications. Hence, the use of UWB devices should not be allowed by the FCC until its interference potential is fully understood. Once there has been sufficient testing to achieve such an understanding, a record can be compiled concerning the degree to which the current ban on UWB transmissions can be relaxed without causing interference to the plethora of services employing spectrum that UWB transmissions would overlay. Only through detailed testing can a record be compiled concerning the limits within which UWB usage is appropriate.

The Commission stated in the *NPRM* that it plans "to allow a reasonable period of time for submittal of test results into the record in this proceeding and will provide an opportunity for

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[2] *NPRM* at ¶ 1.

public comment on the test results before reaching any conclusions."[3] The comment cycle, however, concludes prior to the October 31, 2000 the target date for submission of test results.[4] The Commission said that it would issue a public notice inviting comment on the test results,[5] but Alloy is concerned that a supplemental round of comments may not be sufficient for the development of an adequate record, given the open-ended nature of the *NPRM* and the lack of specific, test-based rule proposals. The Commission should clarify that a further notice of proposed rulemaking will be issued, setting forth specific Commission rule proposals keyed to the test results. This would permit the public to comment meaningfully on rule changes that the Commission concretely proposes.

Alloy is concerned that UWB devices present a considerable potential for nearly undetectable interference. Certain types of UWB transmissions will be "hidden" such that even a spectrum analyzer cannot ascertain them, unless it is in close proximity to the emission source. One of the supposed advantages of UWB is that transmissions will typically fall under the noise floor for the conventional services, making the transmissions undetectable. The fact that an individual UWB device's interference may be immeasurable or imperceptible because it is under the noise floor is not the end of the inquiry, however. Some applications exist that routinely rely on the existence of signals below the noise floor, such as GPS and the Assisted-GPS technology being developed for CMRS Phase II E-911.

Moreover, given the possible wide proliferation of such devices, especially if their use is unlicensed, careful study will be needed to determine the cumulative effect of multiple UWB emitters. Although a single device may raise the noise floor only imperceptibly, a large number

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3 *NPRM* at ¶ 7; *see also id.* at ¶ 31.

4 *See id.* at ¶ 31.

5 *See id.*

of devices may raise the noise floor sufficiently to impair the reliability, quality, or accuracy of conventional services. Furthermore, it is likely that UWB devices will often be used in close proximity to the receivers or transceivers used for conventional services,[6] giving rise to an increased concern over interference.

Wide proliferation of the devices holds significant potential for interference to licensed devices, particularly in the CMRS bands below 2 GHz. The Commission should not move toward authorizing these devices until a record has been established that provides substantial assurance that the widespread use of UWB devices in close proximity to sensitive receivers deployed in conventional services will not result in interference or degradation to the licensed service. The rules ultimately adopted must include stringent equipment standards that ensure that interference and service degradation will not occur, even in the presence of multiple UWB devices.

In any event, Alloy emphasizes that the Commission should take no action toward adoption of rules in this proceeding until, at a minimum: (1) the various UWB tests have been completed; (2) the results of the tests are part of the record; and (3) parties have been given ample time to study the test procedures and results and to comment on them. The FCC needs the benefit of thorough analysis of the test results. Existing licensed operators should be afforded the opportunity to perform such analyses given the prospect of significant, if not detrimental, interference to their operations. Even after testing, analysis, and comment, more testing may be needed. Once the necessary testing has been completed and comments have been received, if the Commission believes that the record justifies moving forward toward adoption of rules, it should

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[6] For example, at a construction site where UWB devices are employed, other wireless devices, such as two-way radios, CMRS handsets, and GPS receivers, are in frequent and common use.

proceed with issuance of a further notice of proposed rulemaking containing specific proposed rule changes, rather than with an immediate report and order authorizing UWB operations.

II. UWB OPERATIONS SHOULD BE LICENSED, NOT UNLICENSED, AND IN ANY EVENT MUST BE COORDINATED

In addressing the regulatory treatment of UWB devices, the *NPRM* proposes unlicensed operation. The rationale stated for this proposal is that "most of the near-term applications for UWB technology involve relatively low powers and short operating ranges," and "most UWB devices are intended to be mass marketed to businesses and consumers and that individual licensing of each device would be impractical."[7] As discussed below, Alloy respectfully submits that unlicensed operation is unwarranted at this time, especially given that the initial uses of UWB will not likely be mass-market applications. Licensing is necessary, at least until this new technology has been proven to be non-interfering in practice. Moreover, coordination of UWB operation is essential, because without coordination it will be impossible to track UWB usage and trace the source of any interference that may occur.

A. UWB Should Be Initially Deployed Pursuant to FCC Licenses, Given the Difficulty of Addressing Problems Resulting from Unlicensed Use

The record of this proceeding suggests that the first likely commercial applications of UWB technology will involve relatively low powers and short operating ranges. As the Commission recognized in the *NPRM*, the first wave of UWB devices probably will involve a variety of short-distance radar-like imaging applications, such as ground-penetrating radar ("GPR") and through-wall imaging devices.[8] According to the *NPRM*, these will be used in the construction and energy industries, as well as in archeological digs and by law enforcement officers and

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7 *NPRM* at ¶ 18.

8 *See NPRM* at ¶ 10.

forensic investigators. If these are the initial applications of UWB technology, however, then the first UWB devices will be used in a professional and industrial setting, rather than in the mass consumer market. In this setting, licensing is eminently practical.

Licensing in this context is also highly warranted, given the lack of any track record for UWB. Licensing will ensure that the use of the technology can be tracked carefully in its initial deployment stage, which will facilitate the detection and tracing of any interference that may occur and the identification of the radiating UWB source. If several years of heavy usage under a licensing regime do not result in interference, the Commission may consider whether licensing continues to be needed.

Unlicensed operation from the outset, however, will provide the worst possible scenario in the event deployment results in interference problems. There would be no central repository of information concerning who has the devices and is using them, and no ready method for tracking usage or compiling interference data. If the devices proliferate freely into the consumer market without an initial phase of controlled distribution only to licensees, it will prove nearly impossible to stop their spread, even if they result in massive and destructive interference. Put simply, it would be much easier to address interference issues that arise when the only UWB devices are GPR units licensed to construction companies and similar operators, than if the issue arises after unlicensed UWB devices are central to the operation of automobiles, intrusion alarms, baby monitors, security fences, space heaters, microphones, toilets, and cameras.[9]

For these reasons, Alloy advocates the licensing of all UWB devices, especially at the outset. Until there is *certainty* that UWB devices will not, in the aggregate, pose a significant risk of interference with licensed services, unlicensed proliferation cannot be justified. The Food

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[9] *See NPRM* at ¶¶ 11, 13.

and Drug Administration does not allow new medications, no matter how appealing, to be sold over the counter in the mass market until they have been proven safe and effective, through tests and then through doctor-supervised prescription use. Similarly, the Commission should not allow a new, largely untried technology to be spread throughout the nation, on an unlicensed basis. Widespread unlicensed use is not justified simply on the basis that the technology is innovative or "interesting"[10] — there must be a record establishing beyond doubt that it is safe to other telecommunications technologies and spectrally efficient.

B. Coordination of UWB Usage Should be Mandatory

Whether UWB is licensed or unlicensed, the Commission needs to ensure that UWB usage is coordinated with licensees whose operations might be affected. As noted by the Wireless Communications Association International ("WCA") in its comments:

> [T]he record before the Commission both in this docket and elsewhere highlights the sheer number of unknown variables that preclude an accurate assessment of the interference risks posed by UWB technology at this time.[11]

Alloy agrees with this assessment. Moreover, the very nature of UWB devices requires that a coordination process be in place before any deployment of UWB systems is allowed. Licensed users of the spectrum — and other users of UWB technology — need to be able to determine who is using UWB devices, as well as where they are using them, in order to avoid causing interference and to provide a tracking mechanism in the event interference occurs. This is true whether the technology is used pursuant to a license or is used on an unlicensed basis. In the absence of coordination, a licensee or a customer encountering interference that results from another's UWB usage would be unable to track it to its source. A cellular licensee or GPS user

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10 *See NPRM* at 5 (reciting "interesting UWB applications").

11 WCA Comments at 4.

that finds its service has become less reliable would not be able to determine who is using UWB in the vicinity and would not be able to tie the interference to a specific UWB user, much less to the technology.

While coordination of unlicensed Part 15 devices might be considered problematic, Alloy notes that there is precedent for requiring coordination of such devices. In particular, the Commission has prescribed coordination rules for unlicensed PCS devices operating in the 1910 – 1930 MHz band.[12] Those rules permit only devices that can automatically be coordinated through UTAM to operate in the unlicensed PCS band, in order to prevent interference with point-to-point microwave users in the band.

Alloy recognizes that widespread deployment of portable UWB devices in the consumer mass market would have the likely effect of precluding coordination. This is especially true if these devices are used in automobiles, for example. However, the early stages of UWB development will provide vital information on the interference potential of UWB devices, and the process of coordination can be used to both warn other spectrum users of potential interference and allow them the opportunity to measure the actual level of interference. If the results of this initial deployment show that interference is not a serious concern in practice, it may be appropriate to eliminate the coordination requirement for devices within a defined technical threshold. At this point, however, there is no record for making such a judgment. Alloy respectfully suggests that coordination of UWB devices should be required until sufficient data have been collected to understand the UWB interference potential, and that mandatory coordination is a necessary part of the cautious deployment of UWB technology.

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12 *See* 47 C.F.R. § 15.307.

III. SPECIFIC INTERFERENCE CONCERNS

A. Potential Interference to "Assisted GPS" Technology Being Developed for CMRS Phase II E-911 Compliance

As noted by several commenters, the potential for interference between UWB devices and Global Positioning System ("GPS") satellite signals is a definite possibility, and a serious concern for a large number of GPS users.[13] As a Commercial Mobile Radio Service provider, Alloy is required under the Commission's Phase II E-911 rules to develop the capability to provide accurate physical locations of wireless devices used to place emergency 911 calls. One of the technologies that Alloy is presently investigating for Phase II E-911 is the use of "assisted" GPS for the rapid determination of latitude and longitude in a variety of RF environments. The term "assisted" refers to the process by which the cellular network provides additional real-time data to a GPS receiver located within a wireless device to allow the device to acquire the GPS signal more rapidly and with much better sensitivity than can be achieved with stand-alone GPS receivers. While stand-alone GPS receivers can acquire a GPS signal down to levels of –130 dBm, assisted GPS extends this sensitivity an additional 20 dB or more, allowing acquisition of the GPS signal at the –150 dBm level. GPS can therefore be used by a wireless device located in a propagation environment (*e.g.,* inside buildings) in which stand-alone GPS was never intended to be employed. Such capabilities will greatly increase the percentage of accurate locations that will be obtained for emergency calls, and is important to wireless customers' safety.

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[13] *See, e.g.*, Comments of the Satellite Industry Association at 2; Comments of Lockheed Martin at 4-5; Comments of Aircraft Owners and Pilots Association at 11-13; Comments of U.S. Department of Transportation at 9-13, Att. 2; *see also ex parte* filings by: US GPS Industry Council dated Oct 2, 2000; National Telecommunications and Information Administration ("NTIA"), dated Oct. 6, 2000 (submitting Memorandum to the Chairman of the Interagency Radio Advisory Council ("IRAC") from the Department of Defense IRAC Representatives).

The –150 dBm sensitivity level achieved by assisted GPS is approximately some 50 dB *below* the noise floor of an RF receiver with a bandwidth corresponding to the 10 MHz GPS signal bandwidth. With this vastly enhanced sensitivity, assisted GPS will be especially vulnerable to interference from UWB devices, which transmit at a power spectral density below the noise floor but potentially greatly above the sensitivity level of an assisted GPS receiver.

For this reason, the Commission should achieve a complete understanding of the effect of UWB transmissions on assisted GPS before allowing any deployment of UWB devices. Assisted GPS has not yet been deployed; it is still under development. If the Commission were to authorize a potentially interfering technology without sufficient testing to rule out interference, questions would be raised as to whether Assisted GPS could be relied upon by wireless carriers as a Phase II E-911 solution.

B. Wireless Communications Applications of UWB

In the *NPRM,* the Commission identified both location applications and wireless communications applications for UWB.[14] Many of the location applications, such as ground- and wall-penetrating radar, mine detection, and fluid-level sensors, are not readily feasible using non-UWB technology — they require the use of UWB technology as a matter of basic physics. Most of the discussion in the *NPRM* focuses on these applications as a basis for moving forward with the authorization of UWB technology. The communications applications of UWB technology, on the other hand, are not unique to UWB. Applications such as wireless networking, secure covert communications, high-data-rate/short-distance transmissions, and outdoor wide area communications systems are not inherently dependent on UWB technology, although some such applications may be facilitated by it.

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[14] *See NPRM* at ¶¶ 10-12.

Alloy is strongly opposed to authorizing the use of UWB technology for communications purposes at this time, given the potential interference that could result to existing forms of communications and the availability of other technologies to accomplish the same ends. Secure communications capability has already been achieved using traditional wireless technologies, such as GSM and CDMA.[15] The use of UWB for communications purposes therefore adds no significant benefit to existing capabilities, while producing an increase in the level of noise and interference in already congested bands.

Ironically, many of the "grassroots" comments filed in this docket, some of which were prompted by UWB proponent Time Domain Corporation, advocate the adoption of UWB rules principally for communications applications, instead of the location technologies that UWB will uniquely facilitate.[16] Indeed, some of these organizations base their well-intended support for UWB on the belief that this technology will facilitate communications for which it may not even be suitable, such as the wireless provision of broadband internet service and elimination of the

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[15] To Cingular's knowledge, there has not been a single recorded incident of successful interception of communications using either of these technologies by an unauthorized third party, despite their widespread deployment in commercial wireless networks. In fact, the National Institute of Standards and Technology and National Security Agency concluded in a joint 1997 report on government wireless telephone security that interception of GSM voice calls is a "low risk" when GSM voice privacy is activated. *See* William E. Burr (NIST) and Richard A. Dean (NSA), *Federal Wireless Telephone Security Risks Results*, at 13-14 (Oct. 15, 1997), *available at* <http://www.antd.nist.gov/fwuf/wrisks/start.html>. Further, IS-136 TDMA technology (and possibly others) supports STU-III functionality. STU-III technology is currently employed over wired and wireless networks to carry all classified Federal government telecommunications, up to and including voice calls by the President of the United States.

[16] *See, e.g.*, Letter Comments of the Department of Health and Human Resources, State of West Virginia, dated Sept. 11, 2000 (filed Sept. 12, 2000) ("I am writing at the request of representatives of Time Domain . . . . I believe that the FCC should authorize the development of ultra-wideband technology, particularly in the areas of communication for natural or man-made catastrophes . . . .").

"digital divide."[17] There is no serious evidence that UWB will play any role in eliminating the "digital divide." In fact, premature widespread deployment of untested UWB technology for communications links may cause interference to radio services that *can* be used to bring broadband services wirelessly to underserved communities.[18]

C. Location Applications of UWB

Obviously, to date there have been very few applications of the different UWB technologies in the private sector; the principal non-experimental uses of UWB have been defense-related (*e.g.*, military radars). UWB advocates are proposing widely varying standards, based principally on experimentation with location applications of UWB, such as GPRs and wall-penetrating location devices. These applications, if not properly constrained by the Commission's rules, can be the source of destructive, and possibly undetectable, interference to GPS and CMRS, which are relied upon by businesses, consumers and public safety entities.

First, Alloy notes, in this connection, that Time Domain's proposed system architecture cannot readily isolate GPS frequencies from interference, while that of MultiSpectral Solutions can. Accordingly, if testing reveals that UWB in GPS bands poses a credible threat of interference, the Commission should concentrate its attention on solutions that can avoid transmissions in the GPS bands. Likewise, if tests show that UWB poses an interference threat to operations in civilian communications bands, such as the bands currently used by CMRS services, the 2 GHz emerging technologies bands, and the 2.7 GHz MMDS/ITFS bands that are candidates for IMT-2000 "3G" technology, the Commission should focus its attention on UWB solutions that can avoid the potential for interference in such bands.

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17 *See, e.g.*, Letter Comments of Rainbow/PUSH Coalition, dated Sept. 12, 2000 (filed Sept. 13, 2000).

18 *See, e.g.*, Comments of WCA at 2.

With respect to ground penetrating radars ("GPRs") in particular, the Commission should adopt rules that minimize the potential leakage of interfering UWB transmissions. In the *NPRM*, the FCC proposes "to define a GPR as an UWB device that is designed to operate only when in contact with, or in close proximity (*i.e.*, 1 meter) to, the ground for the purpose of detecting or obtaining the images of buried objects."[19] Alloy recommends that the FCC should reduce the "close proximity" range to one foot (or a metric equivalent, such as 30 cm) or less. At *any* distance from the ground, metal objects on the ground may reflect the energy emitted by a GPR device. Thus, GPR devices should be as close as possible to the ground before they can be activated. This limitation will minimize reflections that could cause harmful interference to other RF devices in the vicinity of the GPR.

Finally, Alloy is concerned that through-the-wall UWB devices will be sources of harmful interference to licensed and unlicensed systems. These devices will be generating energy in a horizontal plane. At times, the devices will be used in constructing buildings that rise many stories above the earth's surface. Thus, some of the usage will be at a height that is proximate to the heights of nearby licensed radio stations. For example, many CMRS monopoles range in height from 150' to 200'. CMRS antennas are used not only to transmit signals, but also to receive low-powered signals from handsets located some distance from the tower, often along an obstructed, indirect path. For example, a digital CMRS handset may use only a few milliwatts to transmit from an interior office or lobby in a building to an antenna located miles away. A highly sensitive antenna and receiver at the cell site are used to detect these transmissions. If a through-the-wall UWB device is aimed in the direction of the tower, as might occur when a building is under construction or a pipe or stud sensor is being used, the energy from the UWB

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19 *NPRM* at ¶ 25.

device traveling directly toward the tower has the potential to cause harmful interference that is difficult to detect. Likewise, a through-the-wall UWB device may interfere with a nearby CMRS handset. This is not merely a hypothetical concern on the part of CMRS operators. Sprint PCS has shown, on the basis of joint testing with Time Domain, that UWB devices can interfere with CDMA CMRS operations:

> Both the test results and the theoretical model confirm that a single UWB device causes harmful interference when it is within a certain distance of a CDMA PCS handset. Specifically, the tests showed that UWB emissions can affect the forward link of an IS-95 system because they increase the noise floor of the handset receiver. Interference increases as a handset and UWB device are placed closer together. As the noise level increases, the handset requires more power to maintain forward link transmissions to compensate, or offset, the additional noise. Thus, the closer a handset is placed to a UWB device, the more power the handset needs to maintain continued transmission.
>
> The interference generated by a UWB device can have two adverse effects on CDMA-based PCS service. First, UWB interference can cause PCS calls to drop, or prevent the PCS customer from making or receiving calls altogether. This condition will occur if the forward link power required to overcome the UWB interference exceeds the maximum allowed for the handset. However, in addition to this direct blocking, UWB devices can also cause indirect blocking. Specifically, even in situations where the base station can forward the additional power the PCS handset requires to maintain a communications link in order to offset the UWB interference, the base station will correspondingly have less forward link capacity to assign to other PCS customers wanting service from the base station. Thus, UWB interference can reduce the capacity of Sprint PCS' network because a base station will be able [to] support fewer customers than it was designed to serve.[20]

Safeguards should be put in place to minimize the potential interference risks. Alloy supports the FCC's proposed restriction that these UWB devices cannot be activated unless they are in contact with the wall's surface. A mechanical sensor is not practical because a user could

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[20] Sprint PCS Supplemental Comments at 3-4 (filed Oct. 6, 2000) (footnotes omitted).

easily override it. Instead, the actual UWB emission could be used at an ultra-low power level to prevent operation until the device is in contact with (or in immediate proximity to) a surface of a different dielectric constant than air. Automatic power control should also be used to minimize the escape of unwanted emissions from the far side of the wall. The change in dielectric constant at the far side of the wall could be used to measure when an adequate power level has been reached to allow imaging of the wall.

Even with these safeguards in place, the potential for interference to other systems would still exist, because the emission that reaches the far side of the wall must be powerful enough to be reflected and for its reflected component to pass again through the wall's material. The portion of the energy that is not reflected by the distant side of the wall would be radiated into the space on the wall's far side. For these reasons, the Commission should consider limiting the use of through-the-wall UWB devices to very high frequencies, possibly even in the 60 GHz Oxygen Absorption Band, to minimize the potential for interference. In addition, operation of UWB devices should be restricted to the highest possible frequency ranges that will permit adequate performance of the systems. In all cases, with the possible exception of the GPRs, operation should be restricted to the bands above 2.7 GHz due to their potential impact on cellular, PCS and other terrestrial wireless systems, such as the IMTS/MMDS frequencies below 2.7 GHz that are IMT-2000 candidate bands.

CONCLUSION

For the foregoing reasons, Alloy Wireless urges the Commission to proceed cautiously in adopting rules for UWB technology. Testing should be completed and incorporated into the docket before proceeding further. If the Commission believes that the test results provide support for proceeding with rules, it should issue a further notice of proposed rulemaking that would

allow the public to focus on specific rule proposals, and only after notice and comment on such proposals should it adopt rules. Any rules adopted should fully protect authorized services, such as CMRS and GPS, from interference.

Alloy submits that the public interest would not be served by allowing unlicensed use of UWB devices at this time. Licensing their use at the initial stage would better facilitate tracking and mitigation of interference; for the same reason, all UWB devices should be subject to a coordination requirement, whether licensed or unlicensed.

Respectfully submitted,

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